UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P O Box 1450
Alexandria, Virginia 22313-1450
www uspto gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/541,470	01/05/2006	Yoshinori Okazaki	501/43514/Case 101-PCT-US	8942

279 7590 03/31/2009
TREXLER, BUSHNELL, GIANGIORGI,
BLACKSTONE & MARR, LTD.
105 WEST ADAMS STREET
SUITE 3600
CHICAGO, IL 60603

EXAMINER	
KENNEDY, TIMOTHY J	

ART UNIT	PAPER NUMBER
1791	

MAIL DATE	DELIVERY MODE
03/31/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/541,470	OKAZAKI, YOSHINORI	
	Examiner	Art Unit	
	TIMOTHY KENNEDY	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 February 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. By way of the amendment filed 2/23/2009; claims 1 and 9 are amended, and claims 2-8, 10, and 11 are originals.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumamura et al (U.S. Patent 5,102,587, already of record, herein after referred to as Kumamura), in view of Bulgrin et al (From previous Office Action, herein after referred to as Bulgrin). Regarding claim 1, Kumamura teaches:

5. Detecting an angular velocity ω of a motor operative to propel forward a screw in an injection molding machine

6. [Determining] an estimated melt pressure value δ^ without deriving a differential of the detected angular velocity ω, based on an observer, from said detected angular velocity ω of said motor and a torque command value T^{CMD} given to said motor

7. Controlling said motor such that said estimated melt pressure value δ^ follows a melt pressure setting δ^{REF}

8. Kumamura teaches a method of controlling the injection pressure in an electric injection molding machine (Figure 8 and column 12 lines 34-68 through column 14 lines 1-41) by using the same variables and methods as laid out in claim 1. However Kumamura only teaches determining/detecting and controlling the estimated melt pressure, not deriving the estimated melt pressure, and does not teach an observer.

9. In the same field of endeavor Bulgrin teaches mathematically deriving an estimated melt pressure, as discussed in the previous Office Action. Also, Bulgrin teaches arithmetic observers (page 12, claim 4: as pointed out in the previous Office Action). The Examiner would like to note that Bulgrin does teach using the derivative of the angular velocity in the estimated melt pressure calculation.

10. Be that as it may, it would have been obvious to one having ordinary skill in the art at the time the invention was made to be able to apply mathematical formulations, per Bulgrin, using the variables and detection methods as taught by Kumamura to derive an estimated melt pressure without taking the derivative of the angular velocity. Since doing so would improve the process capabilities of injection molding machines (Bulgrin, paragraph 0016).

11. Regarding claim 2, Bulgrin, for the previously stated reason, teaches:

12. Wherein said observer is represented by the following Expression 1 (Expression 1 not shown)

13. ω^ : Estimated value of Angular velocity of Motor

14. Bulgrin et al disclose a means for detecting angular velocity (Figure 8a)

15. d_1, d_2 : Certain coefficients (Figure 8a)

16. J: Inertia moment over Injection mechanism (paragraph 0060)

17. $F(\omega)$: Dynamic frictional resistance and Static frictional resistance over injection mechanism

18. Dynamic frictional resistance and Static frictional resistance are defined as a function of torque and velocity, both of which Bulgrin et al disclose (page 12, claim 4)

19. Bulgrin et al disclose the claimed invention except for Expression 1 (symbolic of a value of a result effective variable). It would have been obvious to one having ordinary skill in the art at the time the invention was made to develop Expression 1 using the known variables, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to develop Expression 1 using the known variables, which are well within the level of ordinary skill in the art, for the purpose of controlling the injection pressure to ensure that the injection process is free of defects. *In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).*

20. Regarding claim 3, Bulgrin, for the previously stated reason, teaches:

21. Wherein said observer is represented by the following Expression 2 (Expression 2 not shown)

22. ω^ : Estimated value of Angular velocity of Motor

23. Bulgrin et al disclose a means for detecting angular velocity (Figure 8a)

24. d_1, d_2 : Certain coefficients (Figure 8a)

25. J: Inertia moment over Injection mechanism (paragraph 0060)

26. $F(\omega)$: Dynamic frictional resistance and Static frictional resistance over injection mechanism

27. Dynamic frictional resistance and Static frictional resistance are defined as a function of torque and velocity, both of which Bulgrin et al disclose (page 12, claim 4)

28. x_{-1} : Value of x at Immediately preceding processing period

29. These values would be known since these are well within the level of ordinary skill in the art and there are means for the detection of these values as described above.

30. Bulgrin et al disclose the claimed invention except for Expression 2. It would have been obvious to one having ordinary skill in the art at the time the invention was made to develop Expression 2 using the known variables, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to develop Expression 2 using the known variables for the purpose of controlling the injection pressure to ensure that the injection process is free of defects. *In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).*

31. Regarding claim 4, Bulgrin, for the previously stated reason, teaches:

32. Wherein said screw in said injection molding machine and said motor are coupled together via a belt suspended around pulleys mounted on respective rotation shafts (Figure 2 and 5), and wherein said observer is represented by the following Expression 3 (Expression 3 not shown)

33. d_1 - d_5 : Certain coefficients (Figure 8a)

34. J^M : Inertia moment at Motor side (paragraph 0060)

35. ω^M :angular velocity of Motor (paragraph 0060)

36. R^M :Pulley radius at Motor side (This would be a known variable of the injection molding machine: Figure 6)

37. F : Tension of Belt (This would be a known variable of the injection molding machine: Figure 6)

38. K_b : Spring constant of Belt (This would be a known variable of the injection molding machine: Figure 6)

39. J^L : Inertia moment at Screw side (paragraph 0060)

40. ω^L : Angular velocity at Screw side (paragraph 0060)

41. R^L : Pulley radius at Screw side (This would be a known variable of the injection molding machine: Figure 5)

42. $Fd(\omega^L)$: Dynamic frictional resistance at Screw side

43. Dynamic frictional resistance is defined as a function of torque and velocity, both of which Bulgrin et al disclose (paragraph 0060)

44. K_w : Elastic modulus of Resin (This is a known variable of the material being injected)

45. K_{wd} : Coefficient of Viscosity of Resin (This is a known variable of the material being injected)

46. σ : Force of Screw pushing Resin (paragraph 0061)

47. Bulgrin et al disclose the claimed invention except for Expression 3. It would have been obvious to one having ordinary skill in the art at the time the invention was

made to develop Expression 3 using the known variables, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to develop Expression 3 using the known variables for the purpose of controlling the injection pressure to ensure that the injection process is free of defects. *In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).*

48. Regarding claim 5, Bulgrin, for the previously stated reason, teaches:

49. Wherein said screw in said injection molding machine and said motor are coupled together via a belt suspended around pulleys mounted on respective rotation shafts (Figure 2 and 5), and wherein said observer is represented by the following Expression 4 (Expression 4 not shown)

50. d_1 - d_5 : Certain coefficients (Figure 8a)

51. J^M : Inertia moment at Motor side (paragraph 0060)

52. ω^M :angular velocity of Motor (paragraph 0060)

53. R^M :Pulley radius at Motor side (This would be a known variable of the injection molding machine: Figure 6)

54. F : Tension of Belt (This would be a known variable of the injection molding machine: Figure 6)

55. K_b : Spring constant of Belt (This would be a known variable of the injection molding machine: Figure 6)

56. J^L : Inertia moment at Screw side (paragraph 0060)

57. ω^L : Angular velocity at Screw side (paragraph 0060)

58. R^L : Pulley radius at Screw side (This would be a known variable of the injection molding machine: Figure 5)

59. $Fd(\omega^L)$: Dynamic frictional resistance at Screw side

60. Dynamic frictional resistance is defined as a function of torque and velocity, both of which Bulgrin et al disclose (paragraph 0060)

61. x_{-1} : Value of x at Immediately preceding processing period

62. These values would be known since there are means for the detection of these values as described above.

63. Bulgrin et al disclose the claimed invention except for Expression 4. It would have been obvious to one having ordinary skill in the art at the time the invention was made to develop Expression 4 using the known variables, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to develop Expression 4 using the known variables for the purpose of controlling the injection pressure to ensure that the injection process is free of defects. *In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).*

64. Regarding claim 6, Bulgrin, for the previously stated reason, teaches:

65. Wherein said screw in said injection molding machine and said motor are coupled together via a belt suspended around pulleys mounted on respective rotation shafts (Figure 2 and 5), and wherein said observer is represented by the following Expression 5 (Expression 5 not shown)

66. $d_1 - d_4$: Certain coefficients (Figure 8a)

67. J^M : Inertia moment at Motor side (paragraph 0060)

68. ω^M :angular velocity of Motor (paragraph 0060)

69. R^M :Pulley radius at Motor side (This would be a known variable of the injection molding machine: Figure 6)

70. F : Tension of Belt (This would be a known variable of the injection molding machine: Figure 6)

71. K_b : Spring constant of Belt (This would be a known variable of the injection molding machine: Figure 6)

72. J^L : Inertia moment at Screw side (paragraph 0060)

73. ω^L : Angular velocity at Screw side (paragraph 0060)

74. R^L : Pulley radius at Screw side (This would be a known variable of the injection molding machine: Figure 5)

75. $Fd(\omega^L)$: Dynamic frictional resistance at Screw side

76. Dynamic frictional resistance is defined as a function of torque and velocity, both of which Bulgrin et al disclose (paragraph 0060)

77. Bulgrin et al disclose the claimed invention except for Expression 5. It would have been obvious to one having ordinary skill in the art at the time the invention was made to develop Expression 5 using the known variables, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to develop Expression 5 using the known variables for the purpose of controlling the injection pressure to ensure that the injection process is free of defects. *In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).*

78. Regarding claim 7, Bulgrin, for the previously stated reason, teaches:

79. Wherein said screw in said injection molding machine and said motor are coupled together via a belt suspended around pulleys mounted on respective rotation shafts (Figure 2 and 5), and wherein said observer is represented by the following Expression 6 (Expression 6 not shown)

80. $d_1 - d_4$: Certain coefficients (Figure 8a)

81. J^M : Inertia moment at Motor side (paragraph 0060)

82. ω^M :angular velocity of Motor (paragraph 0060)

83. R^M :Pulley radius at Motor side (This would be a known variable of the injection molding machine: Figure 6)

84. F : Tension of Belt (This would be a known variable of the injection molding machine: Figure 6)

85. K_b : Spring constant of Belt (This would be a known variable of the injection molding machine: Figure 6)

86. J^L : Inertia moment at Screw side (paragraph 0060)

87. ω^L : Angular velocity at Screw side (paragraph 0060)

88. R^L : Pulley radius at Screw side (This would be a known variable of the injection molding machine: Figure 5)

89. $Fd(\omega^L)$: Dynamic frictional resistance at Screw side

90. Dynamic frictional resistance is defined as a function of torque and velocity, both of which Bulgrin et al disclose (paragraph 0060)

91. x_{-1} : Value of x at Immediately preceding processing period

92. These values would be known since there are means for the detection of these values as described above.

93. Bulgrin et al disclose the claimed invention except for Expression 6. It would have been obvious to one having ordinary skill in the art at the time the invention was made to develop Expression 6 using the known variables, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to develop Expression 6 using the known variables for the purpose of controlling the injection pressure to ensure that the injection process is free of defects. *In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).*

94. Regarding claim 8, Bulgrin, for the previously stated reason, teaches:

95. The method of controlling pressure in an electric injection molding machine according to claim 3, 5, or 7, further comprising: calculating said torque command value T^{CMD} for said motor based the following Expression 7 (Expression 7 not shown); and feeding back said torque command value to said motor. (paragraph 0021)

96. kp: Certain constant

97. α : Certain function or constant

98. Development of constants is well within the abilities of a skilled artisan.

99. Bulgrin et al disclose the claimed invention except for Expression 7. It would have been obvious to one having ordinary skill in the art at the time the invention was made to develop Expression 7 using the known variables, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to develop Expression 7 using the known

variables for the purpose of controlling the injection pressure to ensure that the injection process is free of defects. *In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).*

100. Regarding claim 9:

101. An apparatus for controlling pressure in an electric injection molding machine, comprising: an observer arithmetic unit operative to derive an estimated melt pressure value δ^ without deriving a differential of the detected angular velocity ω, based on an observer, from an angular velocity ω of a motor operative to propel forward a screw in an injection molding machine and a torque command value T^{CMD} given to said motor

102. And a torque arithmetic unit operative to calculate said torque command value T^{CMD} for said motor using said estimated melt pressure value δ^ derived at said observer arithmetic unit and feed back said torque command value to said motor.

103. Kumamura teaches the apparatus in Figure 8 and column 12 lines 34-68 through column 14 lines 1-41. However Kumamura does not use arithmetic units for the observer and torque.

104. In the same field of endeavor Bulgrin teaches arithmetic units for the observer (page 12, claim 4) and torque (paragraph 0021). AS discussed in the previous Office Action. The Examiner would like to note that Bulgrin does teach using the derivative of the angular velocity in the estimated melt pressure calculation.

105. Be that as it may, it would have been obvious to one having ordinary skill in the art at the time the invention was made to be able to apply arithmetic units, per Bulgrin, using the variables and detection methods as taught by Kumamura to derive an estimated melt pressure without taking the derivative of the angular velocity. Since

doing so would improve the process capabilities of injection molding machines (Bulgrin, paragraph 0016).

106. Regarding claim 10, Bulgrin, for the previously stated reason, teaches:

107. The method of controlling pressure in an electric injection molding machine according to claim 1, further comprising deriving a dynamic frictional resistance $F(\omega)$ from a relation between a velocity or position and a torque or current value associated with said motor at the time of injection with no resin loaded.

108. Dynamic frictional resistance is defined as a function of torque and velocity, both of which Bulgrin et al disclose (paragraph 0060)

109. Bulgrin et al disclose the claimed invention except for a dynamic frictional resistance $F(\omega)$ function. It would have been obvious to one having ordinary skill in the art at the time the invention was made to develop a $F(\omega)$ function using the known variables, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to develop a $F(\omega)$ function using the known variables for the purpose of controlling the injection pressure to ensure that the injection process is free of defects. *In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).*

110. Regarding claim 11, Bulgrin, for the previously stated reason, teaches:

111. The method of controlling pressure in an electric injection molding machine according to claim 1, further comprising: defining a dynamic frictional resistance $F(\omega)$ as a sum of a velocity-dependent component and a load-dependent component; deriving said velocity-dependent component of said dynamic frictional resistance from a relation

between a velocity or position and a torque or current value associated with said motor at the time of injection with no resin loaded; and deriving said load-dependent component of said dynamic frictional resistance from a relation between a torque or current value and a pressure value at the time of injection with a plugged nozzle

112. Dynamic frictional resistance is defined as a function of torque and velocity, both of which Bulgrin et al disclose (paragraph 0060)

113. Bulgrin et al disclose the claimed invention except for a dynamic frictional resistance $F(\omega)$ function. It would have been obvious to one having ordinary skill in the art at the time the invention was made to develop a $F(\omega)$ function using the known variables, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to develop a $F(\omega)$ function using the known variables for the purpose of controlling the injection pressure to ensure that the injection process is free of defects. *In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).*

Response to Arguments

114. Applicant's arguments with respect to claims 1-11 have been considered but are moot in view of the new ground(s) of rejection.

115. The Examiner agrees that Bulgrin teaches a melt pressure estimating method and apparatus using the derivative of the angular velocity. Nevertheless, Bulgrin gives motivation for one having ordinary skill in the art to mathematically derive the estimated melt pressure.

116. As shown in the Kumamura reference, the estimated melt pressure is not derived but calculated/controlled/determined in a feedback loop system. Kumamura, teaches the needed variables, but not the estimated melt pressure in a derived equation.

117. The estimated melt pressure is seen as a result effective variable. Since it is dependent on many factors; the individual injection apparatus, the injection speed, the injection force, the injection pressure, the melt temperature, the motor velocity, the motor torque, etc.

118. It is only a logical step that is well within the ordinary skill in the art to take the method and apparatus as taught by Kumamura, and turn it into a mathematical formulation to derive a pressure, per the teachings of Bulgrin. Since all the variables and reasoning's are known in the art.

119. Furthermore, in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., description of the observer) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Conclusion

120. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

121. U.S. Patent 5,728,329: pressure and velocity control/measurements

122. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TIMOTHY KENNEDY whose telephone number is (571) 270-7068. The examiner can normally be reached on Monday to Friday 9:00am to 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Del Sole can be reached on (571) 272-1130. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

tjk

/Joseph S. Del Sole/

Supervisory Patent Examiner, Art Unit 1791